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Correlation of TIMI Risk Score with Gensini Score in Angiographic Study in Patients with Non–ST-Elevation Myocardial Infarction

Mohammad Thoufiqul Islam[*1], Muhammad Shahabuddin[2], Md. Mukhlasur Rahman[3], Nasreen Ahmed[4], Md. Bodrul Amin[5], Mohammad Mahbub-ul-Alam[6]

Abstract

Introduction: *Coronary artery disease (CAD) becomes a major cause of death. CAD is an atherosclerosis process, which progressively develops into plaque that will lead to stenosis of coronary artery lumen. Several studies found that Thrombolysis in Myocardial Infarction (TIMI) risk score is an significant marker of the severity of coronary artery disease.* ***Objectives:*** *To see the correlation between TIMI risk score and Gensini score in patient with Non-ST segment elevation myocardial infarction.* ***Materials and Methods:*** *This cross-sectional observational study was conducted in the Department of Cardiology, Sylhet MAG Osmani Medical College Hospital, Sylhet during the period from 1st September 2018 to 31st August 2020. Total 73 patients with NSTEMI who underwent coronary angiography (CAG) were selected. Patients were divided in two groups: Group A = TIMI score ≤4 and Group B = TIMI score >4. Coronary angiography was performed by experienced interventional cardiologist to assess severity of CAD. Angiographic severity was assessed by Gensini score.* ***Results:*** *This study was conducted on total 73 patients. Age of the patients ranged from 21 to 70 years with the mean age of 51.08 ± 11.11 years. Among them 55 (75.3%) patients were male and 18 (24.7%) patients were female. Total 45(61.6%) patients were in group-A and 28 (38.4%) patients were in group-B. Mean TIMI risk score was 2.89 ± 1.05 in group-A and 5.71 ± 0.76 in group-B. Majorities of the patients in high TIMI risk score group had hypertension, diabetes, dyslipidaemia and history of smoking but most of them had no family history of CAD. Mean Gensini score was 20.47± 18.27 in group-A and 35.00 ± 25.04 in group-B, the difference was significant (p=0.006). There was a positive linear correlation between TIMI risk score and Gensini score (r=0.497; p= <0.001).* ***Conclusion:*** *This study demonsrated that TIMI risk score has positive correlation with Gensini Score in angiographic study in patients with NSTEMI.*

Key words: *TIMI score, Gensini score, NSTEMI.*

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***1. Corresponding Author:**
Dr. Mohammad Thoufiqul Islam
Assistant Professor
Department of Cardiology
Sunamganj Medical College
Sunamganj, Bangladesh.
Mobile No. 01711-021853
E-mail:tawfiqcom4@gmail.com

2. Prof. Dr. Muhammad Shahabuddin
Professor & Head
Department of Cardiology
Parkview Medical College
Sylhet, Bangladesh.

3. Prof. Dr. Md. Mukhlasur Rahman
Professor & Head
Department of Cardiology
Sylhet MAG Osmani Medical College
Sylhet, Bangladesh.

4. Dr. Nasreen Ahmed
Assistant Professor
Department of Microbiology
Sylhet Central Dental College, Sylhet, Bangladesh.

5. Dr. Md. Bodrul Amin
Medical Officer
Department of Cardiology
Sylhet MAG Osmani Medical College
Sylhet, Bangladesh.

6. Dr. Mohammad Mahbub-ul-Alam
Medical Officer
Department of Cardiology
Sylhet MAG Osmani Medical College
Sylhet, Bangladesh.

Introduction:

Cardiovascular diseases (CVDs) are a leading cause of death in the world[1]. Ischaemic heart disease alone caused 7 million deaths worldwide in 2010[2]. Coronart artery disease (CAD) may manifest clinically as either chronic stable angina or acute coronary syndrome (ACS)[3]. ACS encompasses unstable angina, ST-segment elevation MI (STEMI) or non–ST-segment elevation MI (NSTEMI)[4]. A number of risk scores have been developed to predict outcomes in patients with

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ACS. TIMI (Thrombolysis in Myocardial Infarction) risk score can be estimated at the bedside with easy-to obtain clinical, laboratory and ECG parameters[5]. It is well known and used and it has the best discriminitary ability to predict cardiovascular events[6]. TIMI risk score is an important short- and long-term prognostic predictor[7]. Angiography is the method of defining coronary anatomy in patients, providing an anatomic map of the site, severity and the shape and distribution of stenotic coronary lesions. In addition, the vessel size or diameter, presence of intracoronary thrombus and extent of diffuse atherosclerotic diseases can be assessed. The grading of a stenosis is most commonly reported as the percentage reduction in the diameter of the narrowed vessel site compared to the adjacent unobstructed vessel segment[8].

Material & Methods:

It was a cross-sectional observational study, done in the department of cardiology in Sylhet MAG Osmani Medical College Hospital, Sylhet, from September 2018 to August 2020. An approval of study protocol was obtained from the Ethical Review Committee before the commencent of the study. The inclusion criteria were patients between 21-70 years of age, non–ST-elevation myocardial infarction who underwent coronary angiogram. The exclusion criteria were past history of myocardial infarction, cardiomyopathy, valvular heart disease, congenital heart disease, prior coronary revascularization (PCI or CABG). Sampling technique was purposive sampling. Sample size was calculated by using Guilford and Frucher's formula, considering 5% level of significance, 5% precision level (marginal error) and the prevalence rate of coronary artery disease in Bangladesh of 4-6%[9]. Demographic variables were age, sex, height and weight. Independent variables were risk factors for CAD such as hypertension, diabetes mellitus, dyslipidaemia, cigarette smoking and family history of coronary artery disease. Our outcome variables were TIMI risk score and Gensini score. After admission of a patient with chest pain suggestive of ACS detailed history and physical examination was performed. Resting 12 lead ECG was done. Patients were treated according to CCU protocol. Blood sample for high sensitive troponin I was drawn after admission and 6 hours after first sample. A value of > 60.4 pg/ml was considered as positive cardiac marker. Then patients were diagnosed as NSTEMI based on symptoms, ECG and troponin I. Blood sample was sent on next morning for biochemical profile such as fasting plasma glucose, fasting lipid profile and serum creatinine. Clinical demographic variables such as age, sex, BMI and major risk factors for CAD like smoking, hypertension, diabetes mellitus, dyslipidaemia and family history of CAD were recorded. Patient was asked about number of anginal episodes in last 24 hours and aspirin use in last 7 days. TIMI risk score was calculated after biochemical reports are available on second day. Calculation was made according to the simple mathematical sum of each of the following characteristics: age of ≥65 years; existence of ≥3 classical risk factors (hypertension, diabetes, smoking, low HDL cholesterol or family history of ischemic heart disease); previous significant CAD (stenosis of >50%); aspirin consumption in the previous 7 days; at least 2 episodes of angina in previous 24 hours; elevation of cardiac necrosis markers; ST deviations of at least 0.5 mm^2. Those patients with TIMI risk score ≤4 were taken in group-A, those with TIMI risk score >4 were taken in group-B. Repeated ECG was done at 24 hours interval. If ST elevation developed, then this patient was excluded from the study. Echocardiography was done before CAG to see wall notion abnormality and ejection fraction. CAG was done during index hospitalization via the trans-femoral approach using standard techniques. CAG was analyzed by experienced interventional cardiologists. Coronary stenosis ≥70% of the arterial luminal diameter in any view were considered significant lesions. Left main coronary lesions were counted when the luminal diameter was reduced by 50%[10]. Angiographic severity of CAD was assessed by Gensini score. This was intended to take into account: (1) Geometrically increasing severity of lesions (2) cumulative effect of multiple lesions (3) lesion location (4) influence of collaterals. Severity score: with each step in 25 – 50 – 75 – 90 –99 – 100% diameter reduction, assigned values 1–2–4–8–16–32. Segment location multiplying factor: 1.Left main coronary artery (5) 2. Left anterior descending artery-proximal (2.5), mid (1.5), distal (1), first diagonal (1), second diagonal (0.5) 3. Left circumflex artery- proximal 2.5(3.5), distal (1(2)), obtuse marginal(1), posterolateral (0.5) 4. Right coronary artery- proximal(1), mid (1), distal (1), posterior descending artery (1). Gensini score: severity score X segment location multiplying factor X collateral adjustment factor[11]. Then correlation of TIMI risk score with Gensini score was assessed. Each patient was explained about the study procedure and purpose of the study. Then informed consent was taken. Data were collected by researcher himself using pre-designed questionnaire. Data were processed and analyzed with the help of computer program SPSS (Statistical Package for Social Sciences) 25 version. Quantitative data were analyzed by mean and standard deviation; and comparison was done between two groups by unpaired t test. Qualitative data were analyzed frequency and percentage; and comparison was done by Chi-Square ($\chi 2$) test. Pearson's correlation co-efficient test was employed to see the correlation. A probability (p) value of < 0.05 was considered statistically significant. The results were presented in tables and figures.

Results:

This study was conducted on total 73 patients. Age of the patients ranged from 21 to 70 years with the mean age of 51.08 ± 11.11 years. Among them 55 (75.3%) patients were male and 18 (24.7%) patients were female. Total 45(61.6%) patients were in group-A and 28 (38.4%) patients were in group-B. Mean TIMI risk score was 2.89 ± 1.05 in group-A and 5.71 ± 0.76 in group-B. There was history of HTN in 17 (37.8%) patients in group-A and 15 (53.6%) patients in group-B. Diabetes was present in 16 (35.6%) patients in group-A and 17 (60.7%) patients in group-B. History of smoking was present in 14 (31.1%) patients in group-A and 16 (57.1%) patients in group-B. There was family history of CAD in 7 (15.6%) patients in group-A and 9 (32.1%)patients

in group-B. Dyslipidaemia was present in 16 (35.6%) patients in group-A and 15 (53.6%) patients in group-B (Table-II). Mean TIMI risk score was 2.89 ± 1.05 in group-A and 5.71± 0.76 in group-B, the difference was statistically significant(p<0.001) (Table-III). Mean Gensini score was 20.47± 18.27 in group-A and 35.00 ± 25.04 in group-B, the difference was statistically significant (p=0.006) (Fig-3).

Table-I: Age distribution

Age	Number	Percentage
21-30	03	4.1%
31-40	12	16.5%
41-50	25	34.2%
51-60	16	21.9%
61-70	17	23.3%
Total	73	100%

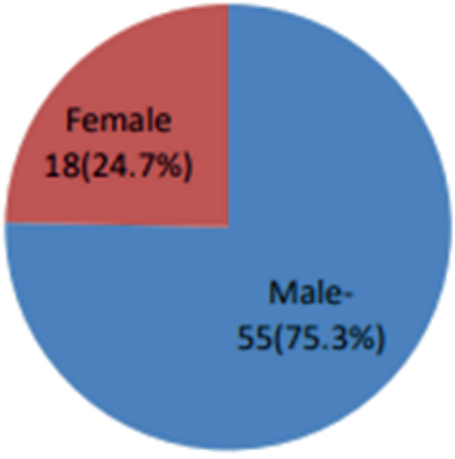

Fig-1: Sex distribution

Table-II:Baseline characteristic of study patient

Variables	Group-A (n = 45)	Group-B (n = 28)	χ2	p-value
Sex				
Male	32	23	1.131	0.288
Female	13	5		
CAD risk factors				
Hypertention	17	15	1.749	0.186
Diabetes	16	17	4.411	0.036
Smoking	14	16	4.832	0.028
Dyslipidaemia	16	15	2.293	0.130
Family history of CAD	7	9	2.775	0.096

Table-III: TIMI risk score of the study population

TIMI risk score	Study subjects		p-value
	Group-A (n = 45)	Group-B (n = 28)	
Mean ± SD	2.89 ± 1.05	5.71± 0.76	<0.001
Range	0-4	5-7	

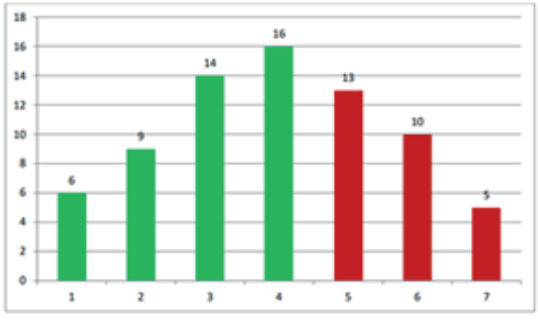

Fig-2: Distribution according to TIMI score (n=73)

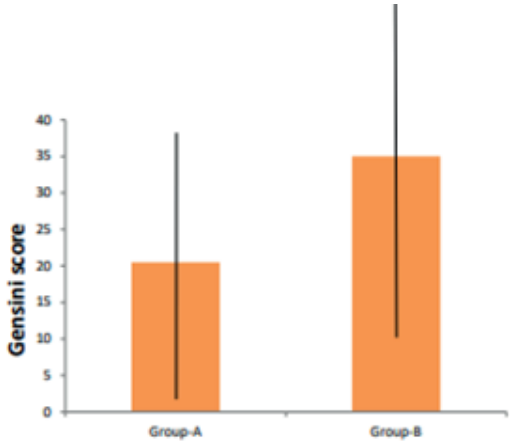

Fig-3: Gensini score of the study population

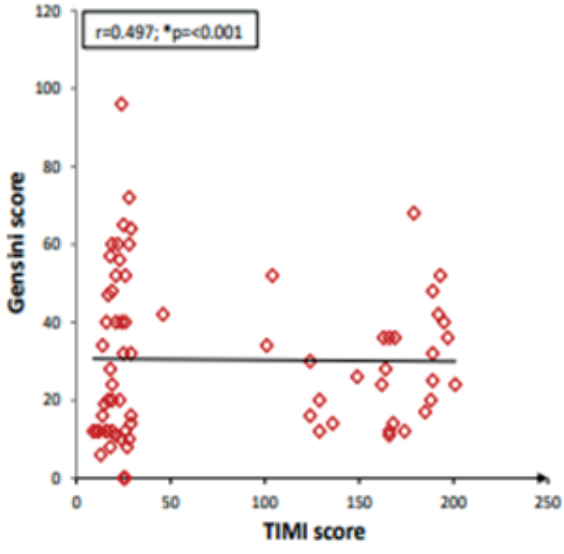

Fig-4: Correlation between TIMI risk score and Gensini score

There is positive linear correlation between TIMI risk score and Gensini score (r=0.497; p= <0.001) suggesting that the higher was the TIMI risk score, the higher was the Gensini score in NSTEMI (Fig-4).

Discussion:

Due to the heterogeneous nature of the population of patients with non-ST elevation ACS, there is wide variation in terms of risk for the occurrence of death or recurrent ischemic events[12]. The risk stratification is important as it has been consistently proved that early coronary intervention in high-risk patients improves clinical outcomes[13]. TIMI risk score is one of the most commonly used scores to risk-stratify for NSTEMI patients at presentation. When originally developed, the TIMI risk score was correlated with clinical end points, such as death, myocardial infarction or urgent revascularization[14]. In addition to predict the clinical outcome in NSTEMI, these scores have also been studied with regards to their correlation with severity of CAD on coronary angiography[15]. The most important advantage of the TIMI risk score is that it can be estimated at the bedside and easy-to obtain. Estimating the coronary anatomy before angiography is performed could be useful when deciding on diagnostic and therapeutic interventions. In this regard, the TIMI risk score could be used in clinical practice to predict the likelihood of a patient having coronary anatomy amenable to CABG[7]. The usefulness of TIMI score in predicting extensive CAD on angiography has been validated in several international studies[5,16,17] . This cross sectional observational study was conducted in the department of cardiology, Sylhet MAG Osmani Medical College Hospital. Main objective was to see correlation of TIMI risk score with severity of coronary artery disease in patient with non–ST-elevation myocardial infarction. In this study age of the patients ranged from 21 to 70 years, with the mean age of 51.08 ± 11.11 years. Most of them were male. Majority of patients in high TIMI risk score group had hypertension, diabetes, dyslipidaemia and history of smoking but most of them had no family history of coronary artery disease. This result is also supported by other studies[5,18-20]. The present study showed that mean Gensini score was significantly higher in high TIMI risk score group. There is a positive linear correlation between TIMI risk score and Gensini score suggesting the higher was the TIMI risk score, the higher was the Gensini score in NSTEMI. This result is also supported by other studies[5,15,21]. The study had its limitations as the selection of cases for coronary angiogram was done the attending cardiologist, which could have resulted in selection bias because the selection criteria by cardiologists for sending the patients for coronary angiogram is not uniform and is subject to physician preferences. Some including only high-risk patients, while others may include low risk patients. The interpretation of the coronary angiogram and the severity estimation of coronary artery lesion was based on visual assessment of the attending cardiologist which could result in differences in the assessment of coronary lesion severity. Another limitation is that this study was conducted in single tertiary care hospital and sample size was small.

Conclusion:

Based on the findings of present study, there is a direct and significant correlation between TIMI risk score and Gensini score in patients presenting with NSTEMI. It may be concluded that TIMI risk score correlates with angiographic severity of coronary artery disease in patients with non–ST-elevation myocardial infarction.

Conflict of Interest: None.

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References:

1. Roth GA, Johnson C, Abajobir A, Abd-Allah F, Abera SF, Abyu G, et al. Global, regional, and national burden of cardiovascular diseases for 10 causes, 1990 to 2015. JACC. 2017;70(1):1-25.

https://doi.org/10.1016/j.jacc.2017.04.052

PMid:28527533 PMCid:PMC5491406

2. Wong ND. Epidemiological studies of CHD and the evolution of preventive cardiology. Nature Reviews Cardiology. 2014; 11:276-89.

https://doi.org/10.1038/nrcardio.2014.26

PMid:24663092

3. Giugliano RP, Braunwald E. Non-ST elevation acute coronary syndromes. In: Zipes DP, Libby P, Bonow RO, Mann DL, Tomaselli GF. Braunwald's Heart Disease: a textbook of cardiovascular medicine. 11th ed. Philadelphia:Elsevier; 2019:1181-208.

4. Baber U, Holmes D, Halperin J, Fuster V. Definition of acute coronary syndromes. In: Fuster V, Harrington RA, Narula J, Eapen ZJ. Hurst's The Heart, Vol 1. 14th ed. New York: McGraw-Hill; 2017: 946-53.

5. Garcia S, Canoniero M, Peter A, Marchena ED, Ferreira A. Correlation of TIMI risk score with angiographic severity and extent of CAD in patients with non-ST-elevation acute coronary syndromes. Am J Cardiol. 2004; 93:813-6.

https://doi.org/10.1016/j.amjcard.2003.12.015

PMid:15050480

6. Lee B, Chang AM, Matsuura AC, Marcoon S, Hollander JE. Comparison of cardiac risk scores in ED patients with potential acute coronary syndrome. Crit Pathw Cardiol. 2011;10(2): 64-8.

https://doi.org/10.1097/HPC.0b013e31821c79bd

PMid:21988945

7. Almagro FJG, Gimeno JR, Villegas M, Hurtado J, Teruel F, Cerdán MC, et al. Prognostic value of TIMI risk score in a unselected population with chest pain. Construction of

new predictive model. The American journal of emergency medicine. 2008; 26: 439-45.

https://doi.org/10.1016/j.ajem.2007.07.011

PMid:18410812

8. Kern MJ, Seto AH. Cardiac catheterization, cardiac angiography, and coronary blood flow and pressure measurements. In: Fuster V, Harrington RA, Narula J, Eapen ZJ. Hurst's The Heart, Vol 1. 14th ed. New York: McGraw-Hill; 2017: 606-56.

9. Islam AKMM, Mohibullah AKM, Paul T. Cardiovascular disease in Bangladesh: a review. Bangladesh Heart Journal. 2016; 31(2): 80-99.

https://doi.org/10.3329/bhj.v31i2.32379

10. Chaitman BR, Bourassa MG, Davis K, Rogers WJ, Tyras DH, Berger R, et al. Angiographic prevalence of high risk coronary artery disease in patient's subsets. Circulation. 1981; 64(2): 360-7.

https://doi.org/10.1161/01.CIR.64.2.360

PMid:7249303

11. Knudtson M. Coronary scoring systems - A historical perspective. available at: http://www.approach.org/pdfs/tutorials/history of coronary scoring March 2014. pdf. Accessed on 20 December,2018.

12. Santos ESD, Filho LDFA, Fonseca DM, Londero HJ, Xavier RM, Pereira MP, et al. Correlation of risk scores with coronary anatomy in non-ST-elevation acute coronary syndrome. Arq Bras Cardiol. 2013;100:511-7.

https://doi.org/10.5935/abc.20130088

PMid:23598458

13. Cantor WJ, Goodman SG, Cannon CP, Murphy SA, Charlesworth A, Braunwauld E, et al. Early cardiac catheterization is associated with lower mortality only among high-risk patients with ST- and non-ST-elevation ACS: observations from OPUS-TIMI 16 trial. Am Heart J. 2005; 149:275-83.

https://doi.org/10.1016/j.ahj.2004.05.055

PMid:15846265

14. Antman EM, Cohen M, Bernink PJ, McCabe CH, Horacek T, Papuchis G, et al. The TIMI risk score for unstable angina/non-ST elevation MI: a method for prognostication and therapeutic decision making. JAMA. 2000; 284(7): 835-42.

https://doi.org/10.1001/jama.284.7.835

PMid:10938172

15. Roy SS, Azam STMA, Khalequzzaman M, Ullah M, Kundu SK, Hossain AMA. Comparison of the GRACE and TIMI risk scores in predicting the angiographic severity of CAD in patients with non ST elevation myocardial infarction. Cardiovasc.J. 2017;10(1):45-51.

https://doi.org/10.3329/cardio.v10i1.34361

16. Lakhani MS, Qadir F, Hanif B, Farooq S, Khan M. Correlation of TIMI risk score with extent of CAD in patients with acute coronary syndrome. J Pak Med Assoc. 2010; 60(3):197-200.

17. Mega JL, Morrow DA, Sabatine MS, Zhao XQ, Snapinn SM, Dibattiste PM et al. Correlation between the TIMI risk score and high-risk angiographic findings in non-ST-elevation acute coronary syndromes: observations from the platelet receptor inhibition in ischaemic syndrome management in patients limited by unstable signs and symptoms (PRISM-PLUS) trial. Am Heart J. 2005; 149:846-50.

https://doi.org/10.1016/j.ahj.2004.08.042

PMid:15894966

18. Bashiruddin ABK, Chowdhury MI, Bhattacharjee B, Shahin AH, Ahsan SA, Mandal MRM, et al. Aassociation of TIMI risk score with angiographic severity of CAD in patients with non-ST elevation acute coronary syndrome. University Heart Journal. 2019;15 (2): 68-73.

https://doi.org/10.3329/uhj.v15i2.42649

19. Mahmood M, Achakzai AS, Akhtar P, Zaman KS. Comparison of the TIMI and the GRACE risk scores with the extent of coronary artery disease in patients with non-ST-elevation acute coronary syndrome. JPMA. 2013; 63(6):691-5.

20. Senthil N, Ramakrishnan SR, Damodharan J. Correlation of TIMI risk score with angiographic severity in predicing extent of coronary artery disease in patients with non ST elevation acute coronary syndrome. Journal of Evidence based Medicine and Healthcare. 2015; 2(41):6981-91.

https://doi.org/10.18410/jebmh/2015/953

21. Howlader AK, Rahman A, Momen A, Kundu SK, Siddiqui MKR, Roy SS. Association of TIMI risk score with angiographic severity of CAD and in-hospital outcome in patient with STEMI undergoing primary PCI. Cardiovasc. J. 2018; 10(2):135-9.

https://doi.org/10.3329/cardio.v10i2.36280